IN THE SPECIFICATION:

Please replace paragraph number **[0009]** with the following rewritten paragraph:

[0009] In addition, the cure temperature ~~typically~~ required to adequately cross-link the polyimide layer is typically about 300°C. This high cure temperature may be detrimental to the integrated circuits of the dice, as well as to the bond pads exposed at the active surface of the dice.

Please replace paragraph number **[0016]** with the following rewritten paragraph:

[0016] The present invention provides a method of applying a layer of protective material to precisely defined areas on individual semiconductor devices fabricated on a semiconductor wafer, on individual dice, or on other semiconductor device component substrates. The present invention employs computer-controlled, 3-D ~~computer-assisted~~ computer-aided design (CAD) initiated, stereolithographic techniques to rapidly form precision layers of material to specific surfaces of a substrate, such as a plurality of dice on a wafer, and to an individual die.

Please replace paragraph number **[0024]** with the following rewritten paragraph:

[0024] The drawings of the application illustrate exemplary embodiments of the invention, wherein the illustrated features are not necessarily to scale, wherein like indicia ~~is used~~ are used for like and similar elements, and wherein:

Please replace paragraph number **[0037]** with the following rewritten paragraph:

[0037] Improvements in the conventional stereolithographic apparatus, as described in ~~copending application serial number 09/259,143, filed February 26, 1999, and of even assignment,~~ U.S. Patent No. 6,524,346 relate to a so-called "machine vision" system in combination with suitable programming of the computer controlling the stereolithographic process. This improvement eliminates the need for accurate positioning or mechanical alignment

of workpieces to which material is stereolithographically applied. Referring to FIG. 2, alignment of the laser beam or other fixing agent may be item specific (i.e., die specific) so that a large number of distinct semiconductor devices, or dice 52, on a wafer 60, each die 52 defined by "streets" 44, may each be accurately coated with a protective layer 50 (see FIG. 10) to the same or differing specifications with regard to numbers of sub-layers 51 (see FIG. 3), layer thickness 40 (FIG. 6), and boundaries 58 (FIG. 3) of areas of dice 52 to be covered by each layer 50 of at least semisolid photopolymer material. Using a machine vision system, accuracy of the process is not dependent on the fiduciary mark 62 (FIG. 3) on a wafer 60 but on the visual recognition of specific physical characteristics of a die 52 or other substrate, whether die 52 is part of a large wafer, a partial wafer, or singulated.

Please replace paragraph number **[0045]** with the following rewritten paragraph:

[0045] Before fabrication of layer 50 is initiated with apparatus 10, the primary STL file is configured for the particular dice 52 or other substrates upon which layers 50 are to be formed. Thus, by way of example and not by way of limitation, the primary STL file is integrated with the file used for forming the integrated circuits on the dice 52 or the features on other substrates. It should be recognized that, while reference is made herein to sequentially forming a layer 50 on dice 52 of a wafer 60, the same process may be used to form a layer on a singulated die 52 or other individual substrate. Furthermore, a wafer 60 having dice 52 of differing dimensions and/or layout may be accommodated by merging of the STL files of the different dice 52 into the primary STL file. Operational parameters for apparatus 10 are then set, for example, to adjust the size (e.g., diameter, if circular) of the laser ~~light~~ beam 28 used to alter the state of (i.e., cure) material 16.

Please replace paragraph number **[0046]** with the following rewritten paragraph:

[0046] Before initiation of a first sub-layer 51 of layer 50 is commenced, computer 12 automatically checks and, if necessary, adjusts by means known in the art, the surface level 18 of liquid material 16 in reservoir 14 to maintain the same at an appropriate focal length for laser

beam 28. U.S. Patent 5,174,931, referenced above and previously incorporated herein by reference, discloses one suitable level control system. Alternatively, the height of mirror 24 may be adjusted responsive to a detected surface level 18 to cause the focal point of laser beam 28 to be located precisely at the surface of liquid material 16 at surface level 18 if level 18 is permitted to vary, although this approach is somewhat more complex. The platform 20 may then be submerged in liquid material 16 in reservoir 14 to a depth equal to the thickness of one sub-layer 51 or slice of the layer 50 or another object to be fabricated and the liquid surface level 18 readjusted as required to accommodate liquid material 16 displaced by submergence of platform 20. Laser 22 is then activated so that laser beam 28 will scan liquid material 16 in a defined path over surface 54 of each substrate, such as the illustrated die 52, in turn to at least partially cure (e.g., at least partially polymerize) liquid material 16 at selective locations on each die 52. For example, laser 22 first defines the boundaries 58 of a first sub-layer 51 on die 52 and fills in solid portions thereof to complete the layer. The boundaries 58 may circumscribe bond pads 34 ~~(FIG. 3)~~ (FIGs. 3-9) or other features on die surface 56 of die 52 which are intended to be left exposed for connection to higher-level packaging as by wire bonding, tape-automated bonding ("TAB") using flex circuits, use of projecting conductive connectors in a "flip-chip" configuration, or otherwise, as known in the art. The circumscription of such features is specified in the STL files in computer 12. In the event that complete layer 50 comprises more than one single sub-layer 51, platform 20 is then lowered by a distance equal to the thickness of a sub-layer 51, and the laser beam 28 scanned to define and fill in a second sub-layer 51 while simultaneously bonding the second sub-layer 51 to the first sub-layer 51. The process is then repeated, sub-layer by sub-layer, until layer 50 is completed.

Please replace paragraph number **[0047]** with the following rewritten paragraph:

[0047] If a recoater blade 32 is employed, the process sequence is somewhat different. In this instance, the surface 30 of platform 20 is lowered into liquid material 16 below surface level 18, then raised thereabove until it is precisely a thickness of sub-layer 51 below blade 32. Blade 32 then sweeps horizontally over surface 56 of die 52, or (to save time) at least over a portion thereof on which layer 50 is to be fabricated, to remove excess liquid material 16 and

leave a film thereof of the precise, desired thickness on surface 56. Platform 20 is then lowered so that the surface of the film and ~~material~~ surface level 18 are coplanar and the surface of the material 16 is still. Laser 22 is then initiated to scan with laser beam 28 and define the first sub-layer 51. The process is repeated, sub-layer by sub-layer, to define each succeeding sub-layer 51 and simultaneously bond the same to the next lower sub-layer 51 until layer 50 is completed. The process is then repeated for each die 52 of wafer 60 or on each of another type of semiconductor device component substrate on which a layer 50 is to be formed. A more detailed discussion of this sequence and apparatus for performing the same is disclosed in U.S. Patent 5,174,931, previously incorporated herein by reference.

Please replace paragraph number **[0052]** with the following rewritten paragraph:

[0052] Once the ~~layers~~ protective layer 50 or other objects are completed on the substrate, such as the illustrated dice 52 of wafer 60, platform 20 is elevated above surface level 18 of liquid material 16, and wafer 60 with protective layers 50 on dice 52 thereof may be removed from apparatus 10. Excess, uncured liquid material 16 on the surface of wafer 60 may be removed, for example, by a manual removal step and solvent-cleaning. Layer 50 on each die 52 of wafer 60 may then require postcuring, as material 16 may be only partially polymerized and exhibit only a portion (typically 40% to 60%) of its fully cured strength. Postcuring to completely harden layers 50 over the entire wafer 60 or portions thereof, on singulated dice 52, or on other semiconductor device component substrates may be effected in another apparatus projecting UV radiation in a continuous manner over wafer 60 or dice 52 and/or by thermal completion of the initial, UV-initiated partial cure. Singulation of the individual dice 52 of a wafer 60 is preferably done following the completed cure but may also be effected prior to a completed cure.

Please replace paragraph number **[0053]** with the following rewritten paragraph:

[0053] A small portion of wafer 60 is shown in FIG. 3, having a plurality of ~~rectangular~~ unusable partial dice 52A, 52B, 52C, 52D, 52E and 52F, etc., with die edges 48 separated by

streets 44 in the X and Y directions. FIGS. 3 and 4 illustrate a die 52 prior to the formation of a protective layer 50 (FIGs. 1 and 8) thereon. For the sake of simplicity, other details of the surface 56 of die 52 are not shown.

Please replace paragraph number **[0060]** with the following rewritten paragraph:

[0060] In practicing the present invention, a commercially available stereolithography apparatus operating generally in the manner as that described with respect to apparatus 10 of FIG. 1 is preferably employed. For example and not by way of limitation, the SLA-250/50HR, SLA-5000 and SLA-7000 stereolithography systems, each offered by 3D Systems, Inc., of Valencia, California are suitable for practice of the present invention. Photopolymers believed to be suitable for use in practicing the present invention include Cibatool SL 5170 and SL 5210 resins for the SLA-250/50HR system, Cibatool SL 5530 resin for the SLA-5000 and Cibatool SL 7510 resin for the SLA-7000 system. All of these resins are available from Ciba Specialty Chemicals ~~Corporation~~ Inc. Materials are selected for dielectric constant, purity (semiconductor grade), good adherence to other semiconductor device materials, and a coefficient of thermal expansion (CTE) sufficiently similar to that of the dice 52 to which the material is applied so that the dice 52 and cured material thereon are not unduly stressed during thermal cycling in testing and subsequent normal operation. One area of particular concern in determining resin suitability is the substantial absence of mobile ions and, specifically, fluorides. By way of example and not limitation, the layer thickness 40 of material 16 to be formed, for purposes of the invention, may be on the order of about 0.001 inch (1 mil) to about 0.020 inch (20 mils), with a high degree of uniformity over a field on a surface 56 of a die 52 or other substrate. In order to achieve a desired physical, environmental, and alpha particle protection of a semiconductor die 52, it is presently believed that a preferred total layer thickness 40 is about 0.004 to about 0.015 inches (4 to 15 mils). As noted previously herein, such thicknesses may be achieved with a single layer. It should be noted that different sub-layers 51 may be of different thicknesses so as to form a completed layer 50 of a precise, intended total height or to provide different material thicknesses for different portions of layer 50. The size of the laser beam "spot" impinging on the surface of

liquid material 16 to cure the same may be on the order of 0.002 inch to 0.008 inch. Resolution is preferably ± 0.0003 inch in the X-Y plane (parallel to platform surface 30) over at least a 0.5 inch X .25 inch field from a center point, permitting a high resolution scan effectively across a 1.0 inch X 0.5 inch area. Of course, it is desirable to have substantially this high a resolution across the entirety of surface 54 of a whole wafer 60 to be scanned by laser beam 28, such area being termed the "field of exposure". The longer and more effectively vertical the path of laser beam 26/28, the greater the achievable resolution.

Please replace paragraph number **[0064]** with the following rewritten paragraph:

[0064] Continuing with reference to FIG. 1 of the drawings, a substrate, such as the illustrated wafer 60, on platform 20 may be submerged partially below the surface level 18 of liquid material 16 to a depth the same as, or greater than, the desired thickness 40 of a first sub-layer 51 of material 16 to be at least partially cured to a semisolid state. If platform 20 was lowered to a greater depth than a layer thickness, platform 20 is then raised to such a depth that the thickness of material 16 over an upper surface of wafer 60 is equal to the layer thickness 40, the surface level 18 of liquid material 16 being allowed to stabilize. The material 16 selected for use in applying a protective layer 50 to dice 52 may be one of the above-referenced resins from Ciba Specialty ~~Chemical Company~~ Chemicals Inc. which exhibits a desirable dielectric constant, is of sufficient (semiconductor grade) purity, of a desirable hardness for physical protection, and which is similar in coefficient of thermal expansion (CTE) to that of the substrate, such as die 52, on which layer 50 is to be formed so that neither the substrate nor layer 50 are unduly stressed during thermal cycling in subsequent packaging, testing and normal operation.

Please replace paragraph number **[0067]** with the following rewritten paragraph:

[0067] As illustrated in FIG. 10, the method of the invention may be adapted to form layers 50 on dice 52 (e.g., LOC dice) already mounted on lead frames 66. In the example of FIG. 10, a series of dice 52 have active surfaces 64 secured to lead frames 66 of lead frame strip 80 and electrically connected thereto, such as by wire bonds 68, thermocompression

bonding, TAB bonding, or otherwise as known in the art. A layer 50 of semi-solid material formed from material 16 may be formed on any particular portion of the active surface 64 or back side 82 (including lead frame 66) of each die 52, for protection, insulation or other purpose. In the example of FIG. 10, a layer 50 of semi-solid material is to be formed on portions of the active surface 64 of a die 52 suspended from lead frame strip 80 and supported on platform 20. Layer 50 surrounds lead fingers of the lead frame 66 and provides attachment thereof to die 52. As already described, a film of liquid material 16 is formed atop the active surface 64 and lead frame 66. A narrow beam 28 of UV laser radiation is precisely scanned by stereolithographic means over particular areas to partially cure the material 16 to form a semi-solid layer 50. The lead frame strip 80 is then repositioned to place the next sequential die 52 in place for formation of layer 50. It should be noted that the process may be conducted without an underlying platform 20 provided that the die 52 and lead frame strip 80 are securely joined and a vertical position of the combination may be precisely attained and retained without underlying support.